

THE INHERITANCE OF MENTAL CHARACTERS

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AMONG those who study man, there is a growing body of opinion which assigns to mental facts a significance far more profound than to physical. "Psychic forces," runs an oft-quoted maxim of a contemporary sociologist; "are the true causes of all social phenomena." It is, therefore, of importance to enquire what in turn are the true causes of psychic forces. Are the agencies which determine the capacities of a man or nation predominantly those which arise from the environment and act upon the individual after birth? Or are they rather rooted in tendencies hereditary in the family or the race, which determine irrevocably the dominant lines along which its members shall develop, long before they are born? This is a question which has often been argued in the case of physical characters; it is a question which, thanks to the psychological complications of every social science and of every social problem, requires discussion yet more imperatively in the case of intellectual, emotional, and moral characters, in a word, for qualities of mind.¹

As to physical characters there can be now no controversy. In body, man is subject to heredity like every other animal; and, it seems, he is subject to it in precisely the same considerable degree.

In the case of many bodily features, the degree to which heredity influences man has been measured with numerical exactitude. This is done by means of the method of correlation. Where a plurality of partial causes co-operate

¹ There are but few books dealing specifically with the subject of mental inheritance. Perhaps the most comprehensive is that of Ribot, *L'Hérédité psychologique* (9th ed., 1910. Eng. trans., 1875). Written, however, before work upon inheritance in general had demonstrated the need for technical, quantitative, and experimental methods, its standpoint is observational and analytic and its style popular.

in contributing to a given effect, it is convenient to measure the influence of each by a single fraction. This is known as the co-efficient of correlation. It expresses the tendency to some form of concomitant variation (such as resemblance) between two variables (such as the stature of fathers and the stature of their sons). It may have all possible values ranging from $+1$ (representing complete correspondence), through 0 (indicating total absence of correspondence), to -1 (representing complete inverse correspondence). Stature provides a convenient illustration. If every son were of the same height as his father the co-efficient of correlation would be unity, that is 1.00. If a son resembled his father in height no more than any other person taken at random, the co-efficient would be 0, or zero. If every son were as short as his father was tall, the co-efficient would be -1.00 . On actually measuring the stature of some 4,886 pairs of sons and fathers, the degree of resemblance between them has been calculated to be .50, or $\frac{1}{2}$; this means that, on the average, the sons deviate from the mean height of the population by about half as much as the father. In health, in colour and curliness of hair, in colour of eyes, in length and breadth of head, the degree of resemblance between parent and offspring, or between one brother and another, is among men much about the same; numerically it varies from .42 to .62. Among animals, the co-efficients of correlation for inheritance vary from .44 (ratio of right antenna to frontal breadth in the green fly) to .52 (coat colour in horse); that is, again, approximately $\frac{1}{2}$. It follows that physical inheritance is of the same order of intensity in man as in the lower animals.¹

Mental inheritance, however, is still a matter for disagreement. Its very existence is constantly disputed and occasionally denied. A well-known writer on heredity has argued as follows: "Suppose a child of refined and educated English parents were reared from birth by African cannibals; then in body, when grown, he would resemble his progenitors more than his captors. But does anyone believe the same of his mind?" He would be pale in complexion and fair of hair; but he would talk cannibal talk, think cannibal thoughts, eat cannibal meat, just as if he were cannibal born. In body European, he would be African in mind; his skin would be white, but his soul black. The very essence of mind, it is urged, is the power to learn by experience. Man is, before all others, the educable animal. Hence, while his body may be shaped by inheritance operating before birth, his mind must be built up by experience after birth. It is, add many, inconceivable that one individual soul can hand on in carnal

¹ Karl Pearson, 'On the Laws of Inheritance in Man' (II.), *Biometrika*, Vol. III. (1904), p. 157.

reproduction its characteristics to another soul. Mental inheritance is, therefore, renounced. "The evidence is overwhelming that mental and moral qualities are not inherited in the same sense as physical qualities."¹

In weighing arguments such as these, an important distinction must be observed at the outset. We must discriminate between those properties of the mind which we may loosely term its capacities, and those which we may term its contents. The contents of the mind, its memories and its habits, its thoughts and its ideals, these are not inherited; they are without doubt acquired during the lifetime of the individual. But the capacity to acquire, and the inclination towards certain acquisitions, these may be present from the beginning. Were no other mental characteristic hereditary, educability, *ex hypothesi*, is. Consequently, differences in educability may be hereditary too. My son might learn far less from his African captors than yours, were both to fall into such hands; though the differences would seem negligible, when compared with what both might have learnt had they not been deprived of the benefits of civilisation. Hence, while gross or absolute achievements are obviously affected by gross environmental differences, within the same environment the relative achievements may differ in a way which allows of no other explanation than inheritance.

For the rest, psychology need no longer rely on *a priori* speculation. It turns to scientific research. Evidence is available in researches carried out upon the mental characteristics both of individuals and of peoples.

I. MENTAL CHARACTERS OF INDIVIDUALS

A. *The Fact of Mental Inheritance*

The first question that confronts us is the question of fact: *are* mental characteristics inherited? In studying individuals three main lines of investigation have been pursued: the collection of family records, the calculation of statistical values, and the application of experimental tests.

¹ Archdall Reid, *Sociological Papers*, Vol. III., pp. 92-3, cf. *id.*, *The Laws of Heredity*, p. 420.

I. PEDIGREES

Family records have been collected chiefly for the more extreme cases of mental capacity,—for mental ability and genius, and for insanity and mental defect.

First in time, and foremost in celebrity, is the collection published by Sir Francis Galton.¹ Galton obtained pedigrees of nearly a thousand eminent men,—judges, generals, statesmen, scientists, poets, painters and divines. Each was sufficiently eminent intellectually to rank as one man in four thousand. He then examined the careers of their relatives. Among these he discovered 89 eminent fathers, 114 eminent brothers, and 129 eminent sons,—in all over 300 immediate relatives of the same degree of eminence as themselves. In addition there were 200 equally eminent men of the next degree of kin. The chance of a son of an eminent man showing eminent ability himself appeared to be about five hundred times as great as that of the son of a man taken at random.

The evidence lends some colour to the assumption that specific kinds of ability are inherited as well as high degrees of ability generally. The families of the Wesleys and the Bachs produced an amazing number of talented musicians. Mendelssohn and Meyerbeer are the only musicians in Galton's list whose eminent relatives achieved success in careers other than that of music. Among politicians the only analogous exception is Benjamin Disraeli, whose father was not a politician, but (as indeed was Benjamin) a man of letters. Among the scientists specialisation of inheritance is even more marked. The family of Galton himself and the allied families of Darwin and Wedgwood have produced no less than sixteen men of high scientific attainments, of whom nine were Fellows of the Royal Society.

The influences at work in the several cases Galton analyses in detail. He concludes: "Men who are gifted with high abilities easily rise through all the obstacles caused by inferiority of social rank. . . . Men who are largely aided by social advantages are unable to achieve eminence, unless they are endowed with high natural gifts." There are, nevertheless, many who admit the facts, but reject the conclusion. They still insist that such genealogies may merely illustrate the value of

¹ *Hereditary Genius* (1869, 2nd ed., 1892).

the mental atmosphere of a cultured home or the power of social influence and opportunity.

Let us, therefore, turn to the opposite end of the scale of mental excellence.

Of all cases of mental inheritance the most fully established and most generally recognised is the inheritance of feeble-mindedness. Feeble-mindedness commonly dates from birth. Reference to the mental state of the parents and grandparents often discovers defect transmitted through three, four, or even five generations. Perhaps the most convincing mass of evidence is that incidentally accumulated by the Royal Commission appointed at the commencement of the century to enquire into the provision made for the feeble-minded. The majority of the witnesses called before it attached supreme importance in the causation of mental defect in children to a history of mental defect in the parents or near relatives; and the general opinion was that, "apart from very rare accidental injuries, there is no such thing as manufactured feeble-mindedness."

In the majority of cases, inherited mental defect is not so radical as to resist all attempts at subsequent training or control. In a proper environment and under adequate supervision, the feeble-minded are neither completely useless to the community, nor entirely unable to contribute to the cost of their own livelihood. In the colony at Sandlebridge, a colony started under Miss Dendy nine years ago by the Lancashire and Cheshire Society for the Permanent Care of the Feeble-minded, the children can knit and make baskets; the women are taught laundry work; and the men work on the farm. Both themselves, and neighbouring schools and institutions, they supply with milk, fruit, vegetables, or other commodities. In 1910 the profit from the land thus farmed was over £500.

The efficacy of training raises the question of the transmissibility of acquired characters in an acute form. Where the feeble-minded have been educated and marry, will their children inherit the specific results of their parents' education or will they inherit the original defect? To this question we must return when we have reviewed the evidence for mental heredity in general.

Insanity presents a more difficult problem. It is never present at birth; and in the relatives the neuropathic tendency may manifest itself in multiform ways,—as temperamental melancholy, drunkenness, pauperism, vagrancy, hysteria, epilepsy, criminality, or mere eccentricity,—without appearing as

certifiable insanity. Dr. Mott has studied the family records, the individual history, or the post-mortem observations of several thousands of lunatics in comparison with patients mentally sound; and has published many illustrative pedigrees.¹ His conclusion is the following:—

Hereditary predisposition is the most important factor in the production of insanity. Causes such as alcoholism, infective diseases, auto-intoxication physical injury, especially head injuries and shocks, emotional shock, sexual excesses, and unnatural practices, are too often wrongly assigned as the sole cause of nervous and mental disease to the neglect of the inborn. There are individuals born of sound stocks, that no acquired conditions,—drink, poisons engendered within, head injuries, emotional shock, distress and even profound misery and destitution combined,—can render insane. There are others, and these are generally from a neuropathic stock, whose mental conditions may be disturbed by any one of these conditions, or very frequently without any apparent cause except the conditions appertaining to the sexual functions in adolescence, the puerperium and the climacteric.’²

In certain forms there are strong tendencies to inheritance of the same type of insanity. ‘Similar inheritance’ has been found in periodic (manic-depressive) insanity, in delusional insanity, and apparently (among brothers and sisters) insanity of adolescence (*dementia præcox*), and chronic mania or melancholia. The general rule, however, is for a different type to appear.

The evidence from family records is thus even more cogent in the case of imbecility and insanity than in the case of genius and talent.³ All these, however, are mental characteristics of an exceptional kind; and exceptions do not necessarily prove the rule. We pass, therefore, from the extremes to the mediocre; from the genealogy of the genius and the pedigree of the defective, to the statistical study of the ordinary man.

¹ F. W. Mott, ‘The Inborn Factors of Nervous and Mental Disease,’ *Brain*, Vol. XXXIV., pts. ii. and iii. (November, 1911). *Id.*, ‘Heredity and Insanity,’ *EUGENICS REVIEW*, Vol. II., No. 4 (January, 1911). *Loc. cit.*, p. 279. The writer expressly leaves out of account cases admitted for (1) general paralysis of the insane which is an acquired disease due to the late effects of an infection by a specific organism; (2) organic brain disease from old age, arterial disease, softening and tumour formations, and (3) true alcoholic insanity with dementia (p. 251).

² *Brain*, *loc. cit.*, p. 84.

³ *The Treasury of Human Inheritance*, which the Eugenics Laboratory has recently commenced to publish, includes authentic pedigrees of the descent of mental characters, pathological and valuable. Thus Parts I. and II. contain pedigrees of deaf-mutism, of legal and administrative ability, and of legal and literary ability; Part III. contains pedigrees of insanity, and of commercial ability and liberal thought.

2. STATISTICS

In tracing the family history of genius or insanity, it is commonly assumed that each individual is either definitely a genius or not; that each individual either definitely has neuropathic tendencies or has not. Normal individuals, however, can seldom be separated in this fashion into sharply demarcated classes. Their mental characters seem rather to vary continuously. They are thus amenable to measurement in terms of a continuous scale. In such cases it is preferable, at any rate in initial researches, to proceed from investigations in the mass rather than from individual instances. This is the principle adopted by the statistical or biometric study of heredity.

Of all statistical studies of mental inheritance the most elaborate is that published by Professor Karl Pearson.¹ The data chosen for examination were the psychical qualities, characterising school children from the same families, and estimated by their school teachers. The material took upwards of five years to collect. Schedules were prepared; and on these the teachers were asked to classify the several pairs of brothers and sisters, according to a prearranged scheme, as 'self-assertive' or 'shy'; 'quick intelligent,' 'intelligent,' 'slow intelligent,' 'slow,' 'slow dull,' 'very dull'; and so on. The characters chosen were traits accessible to observation in daily life. Vivacity, temper, popularity, conscientiousness, self-consciousness, self-assertiveness, and general ability,—these were the psychical qualities assessed. Between 3,000 and 4,000 schedules were returned from some 200 schools. To the data thus obtained were applied the statistical methods elaborated for the biometric study of the inheritance of physical characters in man, in animals, and in plants. For the mental characters of the children the co-efficients of correlation range from '43 to '64, averaging '52. Now these figures are almost exactly the same as those obtained in the same way from the same children for physical characters; those average '53, ranging from '43 to '62. In either case the resemblance between members of

¹ Karl Pearson, 'On the Laws of Inheritance in Man; II., On the Inheritance of the Mental and Moral Characters in Man,' *Biometrika* (1904), Vol. IV., pt. ii., p. 131.

the same families is roughly $\frac{1}{2}$. "We are forced," concludes Professor Karl Pearson, "to the general conclusion that psychical characters in man are inherited within broad lines in the same manner and with the same intensity as physical."

These results are corroborated by results obtained from studying the mental resemblance, not of brothers and sisters, but of parents and offspring. Thus, the degree of parental resemblance in intelligence or ability, as estimated in family records, appears as .58 (Pearson); as estimated by Oxford class lists, as .49 (Schuster).

Somewhat similar figures are yielded by the researches of investigators in other countries. In New York, for instance, the spelling abilities of some 600 children were recorded, and the performances measured in statistical terms by the individual's deviation from the group average for children of his age and sex. The coefficient of correlation between children of the same family was found to be .50.¹ Subsequent studies of spelling have shown that similarities of previous training at home or school have little influence. Hence, the resemblance must be due to inheritance. Another American investigator has measured the resemblances in intellect and morality of nearly seven hundred historical personages, members of royal families of Europe. Between fathers and offspring the coefficients of correlation are .30 in the case of both intellectual and moral capacities.²

More recently two Dutch investigators sent out to all the doctors in Holland schedules containing questions concerning psychical characters observable in ordinary life.³ Each recipient was requested to select one family concerning which he happened to have exact knowledge and in which the children were by preference all grown up, and to answer each question for each member of the family. The list contained ninety questions. They dealt with feelings, inclinations, occupations, intellectual qualities, and miscellaneous and secondary characteristics of the most varied kind. The following are samples:

Is the person concerned resolute or undecided?

Is the person concerned in politics a radical, a liberal, a conservative, or indifferent?

Is the person concerned entirely credible, or inclined to exaggerate or embellish his statements, or is he a liar?

The numerical results have been subjected to further statistical treatment and have been converted into terms of the more usual statistical constants.⁴

¹ E. L. Earle, 'The Inheritance of the Ability to Learn to Spell.' *Columbia Contributions to Philosophy, Psychology and Education*, Vol. XI., No. 2.

² F. A. Woods, *Mental and Moral Heredity in Royalty*, 1906.

³ Heymans and Wiersma, *Beiträge zur speziellen Psychologie auf Grund einer Massenuntersuchung*, *Zeitschrift für Psychologie*, Bd. XLII. (1906, 1907), pp. 1-127 and pp. 258-301.

⁴ Schuster and Elderton, 'The Inheritance of Psychical Characters,' *Biometrika*, Vol. V. (1905-7), pp. 460-469.

The final result is as follows :

"The mean co-efficients of resemblance between fathers and sons, and between mothers and daughters . . . come in each case to very nearly one-third,—the value originally proposed for the parental inheritance co-efficient by Mr. Galton." The resemblances between parents and offspring of the opposite sex are smaller, *viz.*, about one-fifth to one-fourth. The original investigators believe that the resemblance is due mainly to heredity, since in traits subject to training and home influence resemblance is scarcely at all larger than in traits but little subject to them.

The smaller size of the last two sets of coefficients may readily be explained. In these cases the capacities estimated were more complex, and therefore somewhat more accessible to the differentiating influence of a different life-history. The persons possessing them were older. And their characteristics were less immediately under the observation of those making the estimates. Making allowance for the vast differences between the methods adopted and the points chosen in collecting the data, there is an astonishing agreement between the statistical results yielded by the different investigations.

In the case of mental characters it is of especial interest and importance to compare the influence of heredity with that of environment. This further problem has also been attacked statistically.¹ The nature of the home environment has been estimated by ascertaining the physical, economic and moral state of the parents, their employment and their tendency to drink, the number of persons per room, the cleanliness and state of clothing of the child. The correlation of these environmental circumstances with the child's mental capacities, chiefly his intelligence and keenness of vision, have been calculated. The coefficients published vary from $- \cdot 16$ to $+ \cdot 24$. The negative sign indicates that an environmental condition apparently unfavourable appears associated with favourable development of the child. I find that the average of the coefficients concerned with mental capacities alone works out at $+ \cdot 02$. In contrasting figures measuring the relative influence of nature and nurture upon capacity generally, including both body and mind, Professor Kari Pearson concludes : "The influence of environment is not one-fifth that of heredity ; and quite possibly not one-tenth of it."² Omitting the figures given by him for purely physical and bodily

¹ David Heron, *The Influence of Unfavourable Home Environment . . . on the Intelligence of School Children*, and other publications of the Eugenics Laboratory, London.

² Karl Pearson, *Nature and Nurture*, p. 27.

characteristics leaves the averages comparatively unchanged. Hence, the foregoing conclusion may be applied to the relative influence of environment and heredity upon mental characters alone.

Many psychologists have criticised the validity of the figures yielded by the foregoing statistical researches.¹ They urge the following points. The accuracy of the statistical methods employed in evaluating the data cannot compensate for inaccuracies necessarily entailed in collecting them. It may even impart a spurious sense of exactitude. No material is afforded by the majority of the investigations for estimating and eliminating the errors made by the teachers, the doctors, or the biographers who engaged in the collection. Such errors may be either systematic or random, either regular or irregular. The influence of random errors in estimating the individuals' characters may have been considerable. Many of the questions and tables provide only two classes (*e.g.*, emotional, unemotional; popular, unpopular). In but few cases (*e.g.*, political opinions, children's intelligence) does the scale supplied possess as many as four grades or even three. Insertion in the wrong class must, therefore, have had serious consequences wherever it occurred: and where due to accident, must have considerably obscured or diminished the real resemblances. The consequences of such errors have been measured by more recent investigators. It has been estimated that, were allowance made for these, the coefficients affected would be increased to exorbitant values; correlations of .5 (ability) would swell to correlations of .8; correlations of .7 (children's athletics) would be increased to nearly unity. Such figures could not be true. It would mean that the brothers and sisters measured were as alike as the Corsican brothers or Galton's 'identical twins.'

The underlying correlations, therefore, must have been from the outset falsely enlarged. Correlations are commonly enlarged by systematic errors concealed in the observations upon which they are based. Against such a suspicion the data in question are by no means secure. Informed, as they were, of the issue at stake, the observers may have unconsciously inserted into their testimony the very conclusions it was proposed to deduce from their reports. In the case of children's athletic power, much of the resemblance is admitted in the original memoir to be "wholly spurious"; schools with an athletic reputation and an athletic cult, it would seem, tended regularly to return all brothers as alike athletic; other schools tended to report them as non-athletic. Similar differences in personal standards and ideals may have similarly magnified the resultant coefficients in the case of other characteristics. Where one person collected data for but one family this danger becomes most serious. A doctor with a high ideal of industry would tend to

¹ C. Spearman, 'The Proof and Measurement of Association between Two Things,' *American Journal of Psychology*, Vol. XV., 1904, pp. 72-101. Thorndike, *Educational Psychology* (1910), pp. 81-4.

rate a family that worked indifferently hard, as lazy ; while an easy-tempered doctor might report a somewhat less energetic family as industrious.

Some of the errors, therefore, probably magnified the resemblances ; some probably minimised them. We cannot assume that the opposite tendencies were equal. Hence, little emphasis can be laid upon the size of the resultant coefficients or their similarity. Beyond the facts that the coefficients for mental characters, where the environmental influence is problematic, resemble in magnitude the coefficients for physical characters (such as eye colour), where environment could obviously have had no influence ; that where certain environmental influences have been gauged, they do not appreciably affect certain other mental capacities—beyond these facts, there is no cogent evidence to show that heredity is really responsible for the correlations found. Two sisters may resemble one another in conscientiousness, not because they inherit it from their parents, but because their parents have given both the same moral training ; two brothers may resemble one another in bad temper, not because they inherit it from bad-tempered parents, but because their parents have been so good-natured as to spoil them both.

The foregoing researches relied for their data upon subjective impressions. These impressions were derived by untrained observers in ordinary daily intercourse, and formulated in popular terminology, with no standardisation of the rating other than the observers' own ideals. The same objections will be discoverable in all such investigations. The concrete qualities thus accessible,—emotionality, popularity, thrift and the rest,—are too superficial and too complex. They cannot provide a single scale of uniform gradations. They cannot convey the same idea to the different observers. They cannot be governed by the same set of causes in the different persons observed.

For the study of inheritance, therefore, we must turn to simpler mental functions,—functions which can be scientifically defined, functions which can be objectively measured, functions which can be affected by but few factors. These can be isolated and measured only by means of experimental tests.

3. EXPERIMENTS

Of recent years apparatus has been devised to test simple mental capacities independently of subjective impressions. By means of a chronoscope, it is possible to measure, in terms of thousandths of a second, the quickness of a person's response to

various stimuli; and the response may be arranged to include mental processes of all degrees of complexity. By means of a galvanometer, it is possible to measure, in millionths of an ampère, the change of electrical resistance in the body of a person undergoing emotional excitation; and, when other conditions are kept constant, the change proves a reliable index of the degree of emotion felt. For testing the acuity of the senses, the efficiency of the memory, the power of concentration, or the scope of attention, other instruments have been contrived. Applied to students in the laboratory, these yield valuable results. For work upon school children, elaborate instruments are best discarded. They are, as a rule, too alarming, too costly, and too cumbersome. Simpler experiments have, therefore, been invented. But the principles involved are essentially the same.

The earlier attempts to measure mental ability by means of laboratory tests appeared to give extremely discrepant results. The introduction into experimental psychology of statistical devices showed that the apparent discrepancies were due rather to inadequate methods of evaluating the results than to deficiencies of the experimental tests themselves.¹ Subsequent investigations have demonstrated both the advantages and the defects of such tests. Their chief advantage is that they differentiate both the kinds and the degrees of innate capacities with much greater rapidity, accuracy, and minuteness than personal impressions or examination results. Their defect is that they involve special investigations and specially trained investigators; hence data can be accumulated only from small groups of individuals.

Both advantages and defects are illustrated in the following investigation.²

A series of experimental tests were applied to thirty children of a higher Elementary School, thirteen children of a Preparatory School at Oxford, and a boy congenitally feeble-minded.

The children were all between the same age limits. Twelve tests were employed. They dealt with typical mental functions of varying degrees of

¹ C. Spearman, 'General Intelligence Objectively Measured and Defined,' *American Journal of Psychology*, Vol. XV., No. 2, (April, 1904), p. 222.

² Cyril Burt, 'The Experimental Investigation of General Intelligence,' *British Journal of Psychology* (December, 1909), Vol. III., Parts 1 and 2.

complexity: discrimination in lower and higher senses; movement, simple and controlled; memory; learning; scope of apprehension; and maintenance of attention. The tests chosen do not involve to an appreciable degree acquired skill or knowledge. They consist of simple mental tasks for the most part unlike anything the children have ever previously practised. Experiment shows that they are comparatively unaffected by practice at different tasks, or, within obvious limits, by age. There is reason, therefore, to believe that the differences revealed are mainly innate.

By repeating the tests and calculating the correlations between the several series, measures of their reliability or self-consistency may be obtained. The better tests give reliability coefficients of over .8 or even .9. Independent estimates based upon general impressions or examination results are commonly found to range from .5 to .7. Further investigation has shown that the better tests are but little affected by irrelevant conditions, such as the sex or social status of the children tested or the training of the experimenter testing them.¹

The performances of the several groups gave harmonious results. All the tests except two gave significant positive correlations with careful empirical estimates of intelligence. In the two exceptions (touch and weight discrimination) the correlations were either negative or negligible. In these, however, the feeble-minded boy excelled, though at the other tests his performances were, as a rule, the worst of all. Five tests gave correlations with intelligence of over .5. Amalgamated they gave intelligence coefficients of .85 and .91. The coefficients were far higher than those yielded by the school examinations, which, as their high correlations with the memory tests indicated, measure chiefly the power to memorise.

The children tested at the Preparatory School were nearly all sons of men of eminence in the intellectual world—university professors, college lecturers and tutors, Fellows of the Royal Society, and bishops. The children at the Elementary School were mainly sons of small tradesmen. Calculations showed that, with two exceptions, the average performances of the Preparatory boys were all superior to those of the Elementary boys; in most cases superior even to those of the cleverest group of the Elementary boys. The two exceptions are the tests for the two lower senses—touch and weight. These two are

¹ Cyril Burt, 'Experimental Tests of Higher Mental Processes and their Relation to General Intelligence,' *Journal of Experimental Pedagogy* (November, 1911), Vol. I., No. 2, p. 93.

precisely the tests, and the only tests, which yielded negative correlations with intelligence. Hence, it appears that wherever a process is correlated with intelligence, there children of superior parentage resemble their parents in being themselves superior.

We have already seen that proficiency at such tests does not depend upon opportunity or training, but upon some quality innate. The resemblance in degree of intelligence between the boys and their parents must, therefore, be due to inheritance. We thus have an experimental demonstration that intelligence is hereditary.

At Liverpool, tests involving more elaborate apparatus, such as the chronoscope and galvanometer, have been applied to students and older children of the same families, and to parents and their adult offspring. The results hitherto obtained are far too few to be conclusive. So far as they go, they appear in the main to corroborate the results obtained by statisticians. The correlation coefficients measuring fraternal and paternal inheritance vary about .3. Of the mental functions tested, the lower and simpler processes appear to be more dependent upon heredity than the higher and more complex, the emotional more than the intellectual, and the intellectual more than the moral. If these conclusions be confirmed, they will form a sinister comment upon our present system of education. The present system seems far more concerned with training the simpler mechanical processes, such as memory, than the higher processes, such as reasoning; and with training the intellectual processes rather than the moral. It thus aspires to train the very processes which seem least amenable to training.

One other experimental research deserves especial mention.

By means of simple tests Professor Thorndike measured the resemblances of fifty pairs of twins. The tests employed were:—writing the opposites of a set of words, marking A's on a page of printed capital letters, marking words containing certain combinations of letters, marking mis-spelled words, and finally tests of addition and multiplication. Children of the same parents, not twins but about the same age, were also measured, but only in the first two tests. For them the coefficient of correlation fell between

·30 and ·40. The twins, however, show a resemblance which is twice as great as this. For them the coefficients of correlation range from ·71 to ·90, averaging ·78. Of the mental processes, those most subject to training (addition and multiplication) appear, it is true, to yield a correlation slightly higher than those least subject to training; but the differences between them are too slight to be of significance. If due to environment the resemblances should increase with age, so long as the children remained at the same school and lived at their own home. The experimental results, however, show that the older they are, that is, the further they are from birth, the smaller are the correlations: for twins 9 to 11 years of age the coefficients average ·83, for those 12 to 14 years of age they average only ·70. Hence the resemblance is originally due to birth, and is diminished progressively by the post-natal influence of environment.

The specialization of inheritance was strikingly exhibited in the resemblances of twins. It was found that twins might be indistinguishable from each other in their powers of mechanical association, and yet prove extremely dissimilar in their powers of sense-perception. So with other traits. Specific capacities can thus be inherited in total independence of one another.

The influence of environment has also been directly illuminated by experimental research. So far as mental capacities are concerned, training in one mental performance affects other mental performances, even those commonly regarded as due to the operation of the same faculty, to an astonishingly small extent. Training in memorising prose, poetry or tables does not appreciably affect power to memorise letters, dates or nonsense syllables, much less improve the faculty of memory, measured by recognised experimental tests, as a whole.¹ Apparent improvement is due, not to development of mental capacities but rather to the acquisition of definite mental contents,—specific memories, specific habits, specific interests, available ideas of method or of aim.

It appears, therefore, that the effects of post-natal training are unexpectedly circumscribed, and never transferred to functions other than the limited functions specifically trained.

¹ W. G. Sleight, 'Memory and Formal Training,' *British Journal of Psychology*, Vol. IV., pts. 3 and 4 (December, 1911)—the most recent and thorough of all investigations upon this problem.

CONCLUSION

We have now reviewed the chief researches carried out along three convergent lines of investigation. By itself no one of them is free from objections. Taken together, however, their main results are in close agreement. This agreement is the more impressive, because the several lines of investigation have hitherto been followed in complete independence of one another, one school often severely criticising the methods adopted by the others.

Among individuals, mental capacities are inherited. Of this the evidence is conclusive. General mental efficiency (that is, 'intelligence' or 'ability,') and its absence are undoubtedly inherited both in extreme and in moderate degrees. Special mental capacities are probably inherited also, the several qualities being transmitted in relative independence of one another. The intensity of mental inheritance appears closely to resemble that of physical inheritance both in man and in other animals; and, so far as mental capacity rather than mental content is concerned, far to outweigh the intensity of environmental influences.

The fact of mental inheritance, therefore, can no longer be contested, and its importance can scarcely be over-estimated.

B. The Principles of Mental Inheritance

So far it is with the fact of mental heredity that I have dealt; I now propose to glance at its principles. So far we have seen only *that* mental qualities are inherited; we now turn to see *how* they are inherited. The central problem may be stated thus: Does mental inheritance follow the same laws as physical inheritance, or does it follow laws of its own?

In relation to the inheritance of physical characters, the ruling principles, at all events in orthodox biology of the present day, are those associated with the names of Weissmann and of Mendel.

I. WEISSMANNISM

The doctrine advanced by Weissmann is this: Natural selection of spontaneous congenital variations is adequate to

explain all the facts of evolution. In consequence, the inheritance of post-natal characters, acquired by individuals during their lifetime, is an inconceivable, unnecessary, and illegitimate assumption. As regards physical inheritance, this doctrine is now generally accepted.¹

Does this apply to mind as well as to body? If it did, its importance to man would then be profound. This corollary would follow : however much we educated the ignorant, trained the imbecile, cured the lunatic, and reformed the criminal, their offspring would inherit, not the results of education, but the original ignorance ; not the acquired training, but the original imbecility ; not the acquired sanity, but the original predisposition to lunacy ; not the moral reform, but the original tendency to crime. All our work would have to be done afresh with each generation.

Now there is no doubt that it is in the field of mental progress that Weissmannism encounters its greatest difficulties. Consider any instinct ; for instance, that of feigning death ; or, among certain flat-fish, that of swimming on the side. The latter involves at least four coincident and co-operative adaptations : a reflex tendency to swim on the side, a displacement of the eyes to guide the movements, an alteration of the protective colouring of both surfaces of the body, and numerous changes in the structure of the body and fins. It is so easy to explain these as first acquired by the efforts of an unusually intelligent animal, then fixed as a habit, and finally inherited. It is so difficult to believe that they originated by the accumulation of little alterations of structures, bit by bit, till the whole was complete. For, it would seem, each bit is useless without the rest ; indeed the half is not only less valuable than the whole, it is actually more dangerous than none at all. An animal who made a half-hearted feint of death would be eaten up far more certainly than if he had been content, like the rest of his species, to run away. Nor can we postulate a sudden and complete variation : to attribute the origin of the side-swimming flat-fish to a single vast 'mutation' would be absurd. Such arguments as these have led certain writers to assume that mental acquisitions may be handed on, even if bodily acquisitions are not. They have postulated a sort of Racial Memory and even a sort of Racial Soul. Were such a postulate proven, it would relegate psychological inheritance to a shadowy limbo of its own ; it would upset the only intelligible

¹ It is fair to recognise that the biological question is by no means finally closed ; and that experiment may yet furnish evidence against an absolute acceptance of Weissmann's principles. But if inheritance of acquired modifications remains a theoretical possibility, nevertheless, to have evaded demonstration hitherto, its effects must be infinitesimal and for practical purposes negligible. This, I think, is now non-controversial.

explanation of heredity,—the theory of a continuous germ-plasm; it would completely shatter the application of Eugenic principles to all qualities of the mind.

There is, however, an alternative possibility. It is a possibility which explains all serious difficulties, which in some cases is an undoubted fact and which makes no such demand upon our power of imagining the mysterious and the vague. This is the principle known as Organic Selection. Overlooked by biologists, it was discovered simultaneously by two psychologists: Lloyd Morgan in England, and J. M. Baldwin in America. It postulates the inheritance only of small variations, occurring in all directions and successively accumulated; but it points out that a variation which occurs in the direction of the future complex instinct is, in an intelligent animal, by no means necessarily useless. For, while imperfect, it can meanwhile be eked out by intelligence, by acquired habits and conscious guidance; it will in turn co-operate with intelligence; and the two together will save the animal's life, where one alone will not. Thus sheltered, the incomplete variation will now be handed on to offspring; the complete intelligent action will not. But sooner or later, another portion of the completed adaptation will occur spontaneously and fortuitously among the subsequent congenital variations. This again will be protected, handed on, and so survive. Thus by the co-operation of mind, natural selection can evolve the most complex properties of mind, without these properties being inherited except when inborn and not merely acquired.

With the enunciation of this principle the gravest objections against extending the doctrine of Weissmannism to cover also the facts of mental evolution and inheritance disappear. The psychological world has been ransacked for further instances irreducible to natural selection; but without success. Language has been suggested as a crucial case. The members of each nation have spoken their respective mother tongues for centuries. Yet, beyond a common tendency to articulation attributable with ease to pure natural selection, there is no sign of the characteristic habit thus repeatedly acquired being transmitted to the young by inheritance. Till recently, one experimental result remained difficult to explain away. This concerned the nervous system—the place where, as we have seen, transmission would be of greatest value. Brown-Séquard found that, among guinea pigs, the offspring of animals whose sciatic nerve had been cut exhibited what appeared to be a form of epilepsy, and other neurotic tendencies, similar to those induced in the parents by the operation. Recent research, however, has shown that the nature of the symptoms and their causation were entirely misconceived. Some of the most striking of all apparent instances of 'lapsed intelligence,'—the working instincts of the sterile hive-bees, and the complicated egg-laying instincts of certain moths and beetles, which lay their eggs but once, or die before the results of their activities are achieved—these are at most certainly due to the natural selections of blind variations. Being sterile, the working bees have no offspring, to which to transmit the skill their intelligence might be supposed to have taught them. The moths and the

beetles have no opportunity of learning the requisite actions, or of observing their effects, even assuming that they had the intelligence to await, to watch and to comprehend them. These processes, therefore, can never have been individually acquired. Hence, there is no reason to assume that, when individually acquired, such processes are ever inherited.¹

In the case of man, the most conclusive evidence against the inheritance of acquired mental characteristics is afforded by the history of civilisation. Never have forces acted upon the mind with such persistence and in such numbers as during the historic period: never have habits, memories and ideas been acquired and re-acquired upon so vast a scale. Yet, there is a striking consensus of opinion to the effect that, in the main, the human race has, in its innate qualities, remained practically stationary. In inborn mental constitution the civilised inhabitant of Paris or London of to-day is, if anything, inferior rather than superior to the Athenian of the time of Pericles or the Englishman of the time of Shakespeare; and, indeed, if anything, inferior rather than superior to his prehistoric ancestors. The evidence from the size and conformation of their skulls, from the tools and weapons they invented and manufactured, from the rude sculptures and paintings upon their implements and caves suggests that in native ability the primitive peoples inhabiting Europe before the dawn of history were not a whit behind their descendants. Civilisation, therefore, has been an advance in mental content, stored in the environment and re-acquired with each succeeding generation, rather than an improvement in hereditary capacities or an inheritance of the improvements acquired. All that is mentally inherited is the original constitution common to the race and the congenital variations that from time to time spontaneously occur.

This is the inference of the most competent authorities.

"If," says Lloyd Morgan, "mental evolution in man be manifested rather in the progressive advance of human achievement than in the progressive increment of human faculty; if the developmental process has been transferred from the individuals to their environment, . . . if there be thus no conclusive evidence that faculty is improving, but rather the opposite; if all this be so, then it would seem that the ground is cut away from under the

¹ Graham Brown, An Alleged Specific Instance of the Transmission of Acquired Characters. *Proc. Roy. Soc.* (1912), B., Vol. 84.

feet of those who regard mental evolution in man as due to inherited increments of individually acquired faculty. It would seem probable that with the waning influence of natural selection, there has been a diminution also of human faculty. Hence, there is little or no evidence of the hereditary transmission of increments of faculty due to continued and persistent use."¹

By the human mind, therefore, as by the animal organism, acquired characters are never inherited.

2. MENDELISM

The laws associated with the name of Abbé Mendel are of even greater interest than the doctrine of Weissmann. Unlike the statistical laws studied by the biometricians, the Mendelian laws are most clearly established in the case of discontinuous traits; traits which can be sharply separated into classes, and studied in their distribution among the individual members of particular families. There appears, however, some ground for the hypothesis that all physical traits which are truly hereditary as such are discontinuous: that every organism is biologically a patch-work or mosaic of unit-characters each of which is dealt with separately in inheritance. Perhaps the most interesting case of Mendelian principles in man is the inheritance of eye-colour.² If a husband possessing pigmented irides, that is, so-called brown eyes, being himself of an unmixed brown-eyed stock, marry a wife whose irides are non-pigmented, and whose eyes, therefore, are pure blue, the hybrid offspring tend all to have brown eyes. The presence of the pigment is prepotent; brown eyes are, as it is termed, 'dominant.' If, now, we mate a hybrid (and, therefore, brown-eyed) son with a hybrid (and, therefore, brown-eyed) daughter, half of their offspring will be hybrids like themselves, brown-eyed, but of a mixed stock. But the blue eyes have not finally disappeared. They were only latent in the hybrid son; or, as it is termed, 'recessive.' Of the rest of the grandchildren, one half will be blue-eyed, and will always breed true; if mated with blue eyes, they will never reproduce brown. The other half will be brown-eyed, and will also breed

¹ Lloyd Morgan, *Habit and Instinct* (1896), pp. 345-346.

² Hurst, 'On the Inheritance of Eye-Colour in Man,' *Proc. Roy. Soc. (B)* Vol. LXXX., 1908. Davenport, 'Heredity of Eye-Colour in Man,' *Science* (1907), Vol. XXVI., p. 589.

true ; if mated with unmixed, not hybrid, brown eyes, they will never reproduce blue. Thus the presence of brown pigment in the iris is a unit-character ; it never really blends on crossing ; and its presence or absence may persist through an indefinite number of generations, or be entirely eliminated in three. Its presence is inherited only through those who possess it ; whereas its absence may appear to skip a generation.

There is some evidence that hair-colour is transmitted on analogous, though perhaps, more complicated lines.¹ These two characters are of peculiar importance, because as we shall presently see, they are characteristic of the so-called Teutonic race ; and in England, of the three main European racial types, the Teutonic is by far the most easy to recognise, both in bodily habit and in mental temperament. Other simple cases, such as congenital cataract and brachydactyly, leave no doubt that Mendelian formulæ apply to man so far as physical characters are concerned.

In mental heredity the applicability of Mendelian formulæ would be of peculiar importance. Psychological characters are peculiarly complex. Sterilise the criminal, it is said ; and you may be sterilising useful independence as well as disastrous immorality. Sterilise the insane ; and you may be sterilising, not only dangerous eccentricity, but the priceless originality of some allied genius. How, too, can you draw sharp lines between the normal and the abnormally good or bad ? Do they not merge into one another by insensible gradations ? Upon Mendelian principles the answer would be clear. Though, like eye-colour, apparently continuous, and found in every shade,

¹ Hurst, 'Mendelian Heredity in Man,' *EUGENICS REVIEW*, Vol. IV., No. 1 (April, 1912). Davenport, 'Heredity of Hair-Colour in Man,' *American Naturalist* (April, 1909). Vol. XLIII., p. 193. Salaman (*Journal of Genetics*, Vol. I., p. 273 ; *EUGENICS REVIEW*, Vol. III., No. 4), adduces evidence of analogous behaviour in the facial characteristics of races in marriages between Jews and Gentiles. He believes that 'the Jewish facial type, whether it be considered to rest on a gross anatomical basis, or regarded as the reflection in the facial musculature of a peculiar psychical state, is subject to the Mendelian law of Heredity.' This is of special interest to the psychologist. The Jewish people possesses one of the most marked of racial temperaments ; and, in cases of inter-marriage, the temperament appears commonly to be transmitted in correlation with the physiognomy. These extensions of Mendelism, however, have not escaped severe criticism. A recent writer in *Biometrika* (1912, Vol. VIII., pts. 3 and 4), even contends : 'It is not too much to say that the endeavour to make man a complex of sharply-defined unit-characters has failed, and failed completely. Even the researches of Hurst, which were received with an almost lyrical enthusiasm by the adherents of Mendelism, are not above suspicion.'

grade, and blend; yet, again like eye-colour, such characters may really depend upon discrete units, fundamental to them, which are inherited alternatively, and may, by appropriate matrimonial unions, be segregated, eliminated, or preserved.

Are there, then, any signs of Mendelian inheritance in mental characters?

They are found most conclusively in the case of congenital colour-blindness, night-blindness, and (less certainly) in deaf-mutism. These are specific defects of the two most important senses, hearing and sight. Mendelian principles seem to hold good in two instincts in fowls; probably, of feeble-mindedness; and more certainly, in at least one type of insanity (Huntingdon's chorea) and at least one type of ability (musical talent).

Perhaps the most suggestive possibilities are to be sought, not on the intellectual or cognitive side of mental life, but on the emotional or conative. Some years ago, in the course of a series of simple psychological experiments, Professor Binet noticed a marked opposition between the temperaments of his two daughters.¹ One child, Armande, appeared to be unpractical, imaginative, reflective; and, in her reflections and imaginations, sentimental and original. The other, Marguerite, was the reverse. He was even able to measure this difference in quantitative form. On the basis of his results, he distinguished two antithetical mental types,—an objective type, and a subjective type. His differentiation was severely criticised; two cases were declared to be far too few to support such a generalisation.

The same and similar tests have been recently repeated upon a large number of Liverpool school-children for other purposes. The same dichotomy has unexpectedly recurred. In particular, two children, whom we may call Margaret and Mary, yielded numerical differences almost exactly parallel to those exhibited by Marguerite and Armande. Like Marguerite, Margaret is practical and objective. Mary is reflective, subjective, and sentimental, like Armande. Margaret is hard-headed, Mary is soft-hearted. Now, these two children present as striking a contrast in physique and physiognomy as in temperament. Margaret is tall, fair, blue-eyed; in face long, but angular; narrow, but not very narrow, in head. Mary is short, dark, brown-eyed; oval in face and very narrow in head. Margaret belongs to a North European or 'Teutonic' type; Mary resembles the South European or 'Mediterranean' type. Margaret recalls the conventional portrait of the 'Saxon'; Mary, that of the 'Celt.' Both parents are dark, short, and 'Celtic.' Upon enquiry it proved that while three grandparents were dark

¹ *L'Etude expérimentale de l'Intelligence* (1903). Also, *Les Idées modernes sur les Enfants* (1910), p. 252 sq., 'Remarques sur quelques types intellectuels,' esp. pp. 262-276. A brief description of some of the experiments and their results will be found in Myers, *Introduction to Experimental Psychology*, Chapter VII.

and came from the West of Ireland, one was tall and fair and hailed from Yorkshire.

M. Binet had not described the physical characteristics of his two daughters. In answer to a letter he replied, not long before his death, that the characteristics of his daughters had persisted comparatively unchanged, and were therefore presumably innate; further, that in head-form and in colour of hair and eyes they presented analogous differences to my own pair. 'Marguerite,' he writes, 'est en effet plus blonde, les yeux plus bleus, et le crâne plus large que Armande.' He was not, however, disposed to connect the physical signs with contrast in mentality by a necessary law.

Several similar cases have since been observed. The small number as yet accumulated leaves the evidence suggestive, rather than conclusive. There are, too, distinct cases of disharmonism:—'Celtic' temperaments correlated with Teutonic physique, like the brown eyes that are sometimes found with fair hair, or the broad faces that are more rarely found upon narrow heads. Such as it is, however, the evidence indicates strongly that the two temperaments follow, with more or less complication, Mendelian laws.

Finally, it is commonly believed that antithetical temperaments are possessed by the two sexes. This may or may not be true. Experiment shows that certain mental differences, constant though small, obtain.¹ As we pass from higher capacities, such as systematic thought, to lower capacities, such as movement and sensory discrimination, as we turn from intellectual processes on the one hand to instincts and emotions on the other, the sex-differences appear to become more pronounced. The most striking is the relative freedom of women from colour-blindness as contrasted with its frequency among men. Now the phenomenon of sex-limitation inheritance seems explicable only upon Mendelian lines,—upon the principles, that is, of dominance and segregation. Wherever it appears in mental characteristics, therefore, it argues that these mental characteristics are themselves inherited according to Mendelian modes.

So far as our meagre evidence goes, the same principles that govern physical inheritance appear to govern mental inheritance too. The peculiar limitations in the evidence even point to a reason why the same principles govern both alike. The innate mental differences between one individual and another, between one racial type and another, and between one sex and another, suggest by their very nature and distribution, that they are correlated with innate physical differences; they appear secondary to, and dependent upon, differences of sense-organ,

¹ Cf. Cyril Burt and Robert Moore 'The Mental Differences between the Sexes.' *Journal of Experimental Pedagogy*, Vol. I., No. 4 (June, 1912), and ensuing numbers.

differences of muscle, differences of internal organs and viscera, differences of internal secretions and glands, and finally, differences in the architecture and chemistry of 'brain and nerve,' that is, of the central nervous system itself. The inferences, and even the premisses, are as yet but matter for tentative and unverified speculation. Nevertheless, in view of all these intimations, it remains, I think, a legitimate working hypothesis to suppose that the vehicle of mental inheritance is, at bottom, material; that, so far as hereditary differences and hereditary likenesses are concerned, soul depends on body, matter conditions mind.¹

II. MENTAL CHARACTERS OF RACES

Hitherto we have enquired into the facts and principles of mental inheritance as they emerge in the study of the mental characters of individuals. We now pass to the mental characters of peoples. Those who have discussed the influence of remote ancestry, or race, have commonly ignored the exacter knowledge recently obtained as to the influence of immediate ancestry, or family. Hence, the issue here becomes more problematic. Examined, however, in the light of facts and principles learnt in the field of individual psychology, the existence and nature of racial inheritance becomes comparatively clear. Evidence may be sought in two directions: from experimental investigations among savage peoples, and from statistical investigations among civilised.

I. *Savage Races*

It has commonly been believed that in the distance-senses, smell, hearing and vision, uncivilised races are vastly superior to civilised; and, in intelligence, vastly inferior. These beliefs are based upon the observations of travellers, and these in

¹ In describing mental inheritance as 'material,' I do not mean to imply that it is merely mechanistic. But, if it is non-mechanistic, it is so only in so far as it shares this characteristic with all forms of inheritance, physical included. The quasi-vitalistic interpretations of heredity and evolution, which have been so brilliantly enunciated by Driesch and Bergson, and which are now finding favour with so many biologists, are non-mechanistic; the psychologist may even conceive them as immaterial and animistic; but, I believe, to most biologists, they represent principles which, though non-mechanistic, are not anti-materialistic. Upon the part played by mind in evolution, it is necessary only to refer to Mr. McDougall's volume, *Body and Mind*.

turn upon casual impressions. Such sources yield no information as to how far the differences described are innate. For this we must turn to the results of scientific measurements.

In 1898 trained experimental psychologists joined an English expedition to the Torres Straits to investigate for the first time by means of an adequate laboratory equipment a primitive people under their ordinary conditions of life.¹ Subsequently at the St. Louis Exhibition in 1904, Professor Woodworth tested a number of different races.² The results of these and similar investigations are in striking contrast with common belief. Among primitive races, visual acuity is but little superior to that of Europeans; their marvellous powers of sight are found to depend upon powers of inference and interpretation, that is, upon interests, habits, or knowledge acquired. Their discrimination by ear is discovered to be slightly inferior to that of Scotch peasants; considerably inferior to that of English town children, especially those of the intellectual classes. Among Papuans, Dyaks and Todas, touch discrimination is superior to that of children from the country or from the slums; and far superior to that of cultured persons, such as University graduates and undergraduates. Thus the differences in the senses, the oldest mental traits, are constant and small. In higher intellectual processes the difference seems to be a little larger, but still unexpectedly small. The only sign of considerable inferiority was found among Negritoes from the Philippines, and Pygmies from the Congo. At one test, intended to measure intelligence, the Pygmies hardly did as well as the "feeble-minded" and "higher grade imbeciles" in the American asylums. These races are believed to have degenerated. It is unfortunate that no emotional tests have yet been applied; as here the racial differences are probably larger than in any other region of the mind.³

¹ *Reports of the Cambridge Anthropological Expedition to Torres Straits* (1903), II., part ii., p. 189, sq., cf. also Myers, *Introduction to Experimental Psychology*, pp. 91-102.

² Woodworth, 'Racial Differences in Mental Traits,' *Science*, N.S., Vol. XXXI. (1910), pp. 171-186.

³ The doctrine that the chief peculiarities of the primitive mind are to be sought in its emotional side, not in its intellectual side, is perhaps the novel feature of Mr. Franz Boas' recent work, *The Mind of Primitive Man* (New York, 1911).

Professor Woodworth thus sums up the general results. "We are probably justified in inferring that the sensory and motor processes and the elementary brain activities, though differing in degree from one individual to another, are about the same from one race to another."¹

The differences then in innate mental capacities between civilised and uncivilised races, though apparently characteristic, appear astonishingly slight. This confirms our conjectures as to the minds of primitive peoples existing before the dawn of history. In either comparison, the superiority of the modern civilised man is due not to hereditary powers and capacities, but to mental contents and achievements, transmitted and accumulated, not by inheritance, but by tradition.

2. *European Races*

Let us now compare the civilised peoples, not with the uncivilised, but among themselves. Considerable mental differences appear superficially to characterise the inhabitants of different European countries, and of different areas within those countries. Their nature is a matter of popular knowledge. The peoples of South Europe, such as those of Italy and Spain, are commonly described as speculative and deductive in thought, and vivacious, impulsive, fickle, choleric, alternately melancholy and gay, in action and in feeling. The peoples of the North, such as the English, the North German, and the Scandinavians, are commonly alleged to be, in thought, empirical and inductive; and in feeling and in action, reserved, sanguine, bold, enterprising, independent. The former are depicted as light-headed and hot-blooded; the latter as hard-headed and cold-blooded. The peoples of Central Europe, such as those of South Germany and Russia, are commonly described as phlegmatic, conservative, catholic, stable, submissive, unprogressive, heavy and slow. Even within the British Isles there are well-attested mental differences among the various local types. We are accustomed to contrast the Irish and the Welsh with the English and the Scotch. To the stranger,² the former appear to be as lively and

¹ *Scienza, l.c.* (I should like to have the word 'about' italicised).

² *E.g.*, the American Anthropologist, Ripley, *The Races of Europe*, p. 333.

as loquacious as the latter are reserved and taciturn; as imaginative and as emotional as the others are truthful and just. Easily elated and as quickly collapsing, "inconstant, mobile, musical," "always ready to react against the despotism of fact," possessing "a quick genius checkmated for the want of strenuousness or else patience," the disposition of the Welsh and Irish has formed a theme for comment for centuries.¹ With them contrast the Yorkshireman.

"In few parts of Britain does there exist a more clearly marked moral type than in Yorkshire. . . . The character is essentially Teutonic, including the shrewdness, the truthfulness without candour, the perseverance, the energy and industry of the Lowland Scotch, but little of their frugality or of the theological instinct common to the Welsh and Scotch, or the more brilliant qualities which sometimes light up the Scotch character. The sound judgment, the spirit of fair play, the love of comfort, order and cleanliness, and the fondness for heavy feeding are shared with the Saxon Englishman, but are still more strongly marked, as is also the bluff independence. . . . The mind, like the body, is generally very vigorous and energetic; and extremely well adapted to commercial and industrial pursuits, as well as the cultivation of the exact sciences; but a certain defect in imaginative power must be admitted,—probably one reason why Yorkshire, until modern times, was generally behindhand in politics and religion.²

These differences are said to reappear in the geniuses springing from families indigenous to the various localities. Thus, of the 120 most eminent British men of science twenty-one are Scotch and only one Irish; of the forty-two most eminent actors none are Scotch and six Irish. The Anglo-Danish geniuses have been mathematicians (*e.g.*, Newton, numerous Cambridge men) or geologists (Darwin); the East Anglian, natural historians (Francis Bacon, Gilbert, Ray), or surgeons; the Southern, scientists, physiologists (Harvey, Stephen, Hales, Huxley), and physicists (Adams, Thomas Young).³

Are these regional differences in intellect, temperament and character due to heredity and race, or to environment and tradition? On the one hand, we have seen that even between European and non-European races, and between pre-historic and civilised races, the innate mental differences are amazingly small; on the other hand, as attested both by type of skull and

¹ The quotations are from Giraldus de Barry (twelfth century), Henri Martin, *Les Races Anciennes d'Irlande* (1878), and Matthew Arnold respectively.

² Beddoe, *The Races of Britain* (1885), p. 252.

³ Havelock Ellis, *A Study of British Genius* (1904).

by type of culture and custom, these small differences have often persisted unaltered in certain areas through all the vicissitudes of history, or have followed the movements of the several peoples as they migrated into other grounds.

The chief criteria for the classification of European races are certain physical features. These are, more particularly, three: the shape of the head and face, the colour of the hair and eyes, and stature. Of but little value independently, taken together, and checked by less regular clues such as physiognomy, language and history, they appear comparatively reliable. Three fundamental racial groups are commonly distinguished. Descendants of palaeolithic man are dubious and rare; ignoring these, (1) the oldest extant European race appears to be the short, dark, narrow-headed, oval faced peoples, found in greatest frequency in South Italy and Spain. Its members resemble in many respects the men of neolithic culture, the men who developed the culture of the age of polished stone, and left their implements, their short skeletons, and their long skulls interred in long burrows or mounds. In the British Isles, it appears to form the chief element in the so-called 'Celtic,' or rather Celtic-speaking populations. This is variously known as the Iberian, South European or Mediterranean race. (2) A shortish, darkish, pre-eminently broad-headed, round-faced race is found around the Alps, in Central France, and Little Russia; and is sometimes identified with the peoples that brought the Celtic language and a bronze civilisation, perhaps from Mongolian Asia, into Western Europe; taught them apparently to the older inhabitants; then themselves died out or migrated again eastwards, leaving their ancestors' round skulls buried in round burrows. These are variously known as the Celtic, Celto-slavic, Alpine, or Armenoid races. Finally, (3) a fair-haired, blue-eyed race, tall, and rather long in head and face, appeared in historic times from the regions around the Baltic. As Saxons, Danes, Norse, Franks, Lombards, Burgundians, Goths, Ostrogoths, and Visigoths, they overran all Europe, thrusting the older races into the remote uplands and isolated peninsulas. Their purest representatives are to be found in Scandinavia. They form the Nordic or Teutonic race. Teutonic, Alpine, Mediterranean,—North European, Central European, South European,—this threefold classification we may perhaps accept.¹

Among the racial groups thus distinguished by physique, the anthropologists of the nineteenth century discovered also certain hereditary peculiarities of temperament or mind. To sum them up in a single term, popular or technical, is undoubtedly fallacious. Briefly, and therefore loosely, we may epitomise them thus. The North European race and the South European race they seem to have conceived as active or, as we might now say,

¹ This is not the place to estimate the validity of the criteria proposed, the measurements made, the calculations based upon them, or the attempts to combine physical characters into racial types. It is sufficient to warn the reader that every step in the procedure has been severely criticised.

'conative,' races. The Central European race as passive or non-conative. The activities of the South European were conceived as imaginative or emotional in tendency, or in a word, affective. Those of the North European as intellectual and practical, in a word, cognitive. It will be seen that these suppositions account with some plausibility for the local differences in temperament noted above.

The racial school of sociologists, the hereditarians, derived much of their data from French sources. In France, each of the three fundamental types is fully represented. Statistical surveys of the population according to stature, colour and form of head are in agreement. They point to a strong Teutonic element in the North, spreading from the basin of the Seine further north into Flanders, and southwards towards Bordeaux; a strong Mediterranean element along the Southern coast, spreading up the Rhone to meet a Teutonic stream at Lyons; and four isolated Alpine groups, in the Vosges mountains, the Savoy Alps, the Auvergne Plateau, and the peninsula of Brittany. Further surveys have been utilised to throw light on the intellectual, moral and artistic, domestic, social and political tendencies of these areas. It appears that the Teutonic and the Mediterranean departments yield the largest proportional number of noted men of letters, and obtain the greatest number of awards made by the Salon at Paris; in Alpine departments these distinctions are rare. The several Alpine districts, however, are peculiarly free from divorce and suicide, which become most intense in the Teutonic areas. Except in Brittany, and disregarding cities, the Alpine inhabitants tend to occupy separate dwellings,—homes of their own; the Teutonic inhabitants prefer tenements and boarding houses. In the elections of deputies the Alpine areas return chiefly conservatives; the Teutons and Mediterraneans radicals. These differences harmonise well with the hereditary differences assumed; and the general coincidence of geographical distribution of the mental characters with those of the physical is most alluring.

Analogous coincidences have been traced in other countries,—such as Germany and Italy. Many, indeed, contend that they do not harmonise with those discovered in France; yet an impartial analysis finds but few contradictions.¹

Of recent years a new school of anthropo-geography has arisen. Like Mill and Buckle in an older generation, these writers are thorough-going environmentalists. The psychological characters of human societies they attribute to their material environment, geographically and economically regarded, almost as exclusively as the hereditarians attributed them to race.²

¹ For further discussion, see Ripley, *The Races of Europe*, Chapter XIX. 'Social Problems, Environment *versus* Race.'

² Perhaps the best elaboration of the principles of this school in English is to be found in Miss Semple's *Influences of Geographic Environment, on the basis of Ratzel's system of Anthropo-geography* (1911).

Thus, the mental features of Teutonic and Mediterranean France, enumerated above, they deduce from the fact that these peoples happen to have settled in fertile and populous river basins and coasts; those of the Alpine populations they ascribe to the infertility and isolation of the mountain areas in which they are confined.

Now it is impossible to deny all efficacy to environment, natural and social alike. It is impossible to deny that, where civilisation has suspended natural selection, peculiarities of social environment still contribute to a large extent to determine the mental character, and especially the mental contents, of the individuals who compose a nation or community. It is impossible to deny that, before civilisation conquered nature, the natural environment must have determined the capacities of the surviving races by eliminating those that were mentally unfit to live in it under primitive conditions. Thus, a nomadic people would be evolved upon the steppes; an inactive, sedentary people upon fertile plains; a daring, roving independent people among maritime fiords. The difficulty which confronts the exclusive environmentalist is this: when the races thus evolved migrate to new regions, they do not completely or immediately acquire characteristics suited to their new mode of life, but may for centuries preserve the old. Nor are the elements preserved merely the ancient beliefs and institutions handed on by tradition. The persistence of a tradition alone would imply the persistence of the temperament to which it was congenial. The Alpines or Celto-slavs from the mountains preserve the temperament of a mountain race in the plains of Brittany and White Russia. Irish and Jewish emigrants are notoriously true to their racial character all the world over. The Teutons of Cumberland, in an infertile, sparsely populated area, are as suicidal as the most densely populated parts of the 'black country,' while the survivors of the old British population left unmolested by the Teutonic invasions from the South and East in and around Hertfordshire, are as immune to suicide as Wales, or Cornwall, North Scotland or Ireland, in spite of their proximity to London.¹

¹ Morselli, *Suicide* (Int. Sci. Ser., 1881), Maps, *ad. fin.*, Tabs. 1 and 4. The persistence of these racial tendencies, irrespective of changes in economic, social, or material conditions, is at length finding recognition among leading economists.

To meet this difficulty the environmentalists make two flagrant biological assumptions, which they seldom think to question. They assume, first of all, that, after the environment has operated upon a community through a number of generations in succession, the characters, thus cumulatively re-impressed upon it, must become for the time hereditary. Secondly, they assume that, when migrating populations meet and mingle, their peculiar characteristics blend and neutralise one another, thus at length producing a homogeneous and characterless race once more, upon which environment can act afresh.

These assumptions, however, are in violent antagonism with the principles of Weissmann and Mendel. There is, we have seen, every reason to believe that acquired mental characteristics are not inherited; and that innate mental characters do not necessarily blend, but may segregate and persistently reappear in their original purity. Nor is there any reason to believe that since the dawn of history, among the civilised peoples either of the present or the past, environment has operated by way of natural, economic, or social selection to alter fundamentally the innate racial characters as originally evolved.

Finally, it is important to remember one further point. If the conditions incidental to life in a populous district affect the mental characteristics of a people, it is the mental characteristics of the people that have made them prefer the populous district. Statistical investigations have established this. The population of towns grows steadily darker in complexion, shorter in stature, and narrower in head. The population of the countryside remains broad-headed. The darkness might be ascribed to 'dominance'; the shortness to poverty; the head-shape itself has sometimes been found to change among immigrants in one or two generations. But even the environmentalists have chosen the more obvious explanation. "We are forced to the conclusion," says Ripley, "that there is some mental characteristic of the long-headed types, either their energy, ambition, or hardiness, which makes them peculiarly prone to migrate from the country to the city; or else, a peculiar disinclination on the part of the broad-headed race thus to betake itself to towns."¹

The plausibility of the environmentalist is thus left reposing upon a single, slender point,—its superior intelligibility. It is easy to picture the mode of operation of the environment. It is hard, as yet, to imagine the mechanism of heredity. This is a seductive basis for a theory; but for a

and social writers. Cf., for instance, Marshall on 'The Character of Englishmen,' *Principles of Economics* (1898), pp. 34-5; or the Webbs, on racial differences in the 'Instinctive Standard of Life,' *Industrial Democracy* (1902), esp. footnote, pp. 697-8.

¹ *The Races of Europe*, p. 548.

theory otherwise unsupported, it is inadequate. It is a motive, not a reason, for belief. Not intelligibility, but verifiability, is the test of truth. Wherever we have hitherto been able to verify and measure the influence upon mental capacity of heredity and environment, namely, in every method used for studying the characters of individuals, there we have found heredity operating, operating indeed mysteriously, yet operating surely and powerfully; there we have found the operation of environment elusive, transient, and negligible. Accordingly, when we turn to races, we have no right to repudiate a principle indicated *prima facie* by the evidence before us, established as a *vera causa* by evidence elsewhere, inevitable in the long run even when the alternative hypothesis has been exploited to the uttermost.

Environment, therefore, may explain the differences in different societies of the traditional mental contents. Heredity remains indispensable to explain the differences in mental capacities. These differences are the more fundamental.

We recognise, then, the presence of hereditary mental differences even among the races of civilised Europe. Like the differences between civilised and uncivilised, these differences must again be small. But a slight bias may produce large deflection. Eluding the experimentalist, either because in degree they are so small, or because in kind they are emotional rather than sensory or motor, these differences may well have sufficed, in the national selection from those mental contents which form the common stock of civilisation, to determine a choice of institutions, customs, and beliefs congenial rather than uncongenial to the native temperament of each community. Each community, by its minute hereditary proclivities, thus accumulates a vast tradition, markedly characteristic, eventually unique, but not itself hereditary. Indulge now in a flight of fancy. Imagine that all the babies born in France had at one time been exchanged at birth for those born in England; that ultimately England had become secretly peopled with inhabitants of purely French extraction; and France with inhabitants purely English. Suppose further that the occasion chosen was the generation preceding some crisis in the national history,—the Protestant Reformation or the French Revolution. Would the most ardent advocate of the omnipotence of the environment dare to maintain that the nation would nevertheless have continued its original career, or that its subsequent history would

not have to be rewritten ?¹ Mental inheritance, then, not only moulds the character of individuals ; it rules the destiny of nations.

CONCLUSION

We have now reviewed the chief evidence for the inheritance of mental characteristics both in the individual and in the race. We have noticed the principles which such inheritance obeys. In the case of the individual, we found the influence of heredity large and indisputable ; in the case of the race, small and controverted. In neither case can it be suggested that the facts are so ill-attested as to be unworthy of practical consideration, or so insignificant as not to merit further scientific research. In both cases the principles indicated, and the methods available, are analogous to those which have proved so pregnant in recent investigations of heredity in other spheres. Yet scarcely a fact, and not a single principle, is placed beyond the need for corroboration ; and, thanks to the intimate bearing of psychology on social welfare, such corroboration is in urgent request. There assuredly could be no problem upon which historian and geographer, traveller and administrator, biologist and experimentalist, statistician and psychologist, could so fruitfully concentrate their wisdom as the problem of heredity and its influence upon the mind.

¹ The suggestion is, I believe, Mr. McDougall's.